fascia of the fore wings, in this last respect approaching somewhat *P. odenatus*, West. One specimen, however, from the above district, but unfortunately not precisely localized, differs so much that though, judging from one specimen only, it is probably only a variety of *P. cyprææfila*, yet, as Prof. Westwood regards *P. odenatus* as requiring a specific name, I have followed him (for the sake of uniformity in the nomenclature of these closely allied forms) in distinguishing this apparent variety by a name also:—

Var. *gallienus*, Dist.

Differs from *P. cyprææfila* in the much narrower central fascia of the hind wings, which is only 8 millims. wide, and in the smaller and more divided spots of the macular fascia of the fore wings. These fasciæ and marginal incisures are also of a pale-lemon hue.

Papilio zalmoxis, Hew. Ex. Butt. iii. *Pap.* t. 6. f. 18 (1864).

One specimen from R. Ogowai (Nassau) is remarkable for its smaller size, $5\frac{1}{10}$ inch, rather more than 1 inch less in expanse than type and ordinary specimens. The ground-colour of the underside of posterior wings is also darker ferruginous.

Papilio horribilis, Butl. Lep. Ex. p. 88, t. 34. f. 2 (1872).

Var. *calabaricus*, Dist.

This variety differs chiefly from Butler's figure in the submarginal row of five spots to the posterior wing. The upper three are very small; but of these the central one is much the largest and the third the smallest and indistinct (sometimes wanting); fourth and fifth very much the largest, fifth much smaller than fourth. *A red spot on lower portion of abdominal margin.* The median fascia to hind wings is generally narrower and straighter than in *P. horribilis*, but in one specimen agrees in that respect with Butler's figure. I have examined thirteen specimens, and, finding these characters constant, have distinguished it as a variety of *P. horribilis*, though probably it should be more correctly called a distinct "local race."

Isubu, Mongo-ma-lobah.

5. Note on the Mechanism of Respiration as well as of the Retraction of the Head and Limbs in certain Chelonia. By A. H. Garrod, M.A., F.R.S.

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For some time past I have been acquainted with the fact that in Tortoises the movement of the limbs influences the degree of inflation of the lungs; and on one occasion I have been able, in a dead specimen of a large species, to blow out a candle by means of the current of air issuing from the nostrils consequent upon my forcibly pushing inwards one of the previously extended anterior limbs. From this I inferred that the rigidity of the thoracic and abdominal walls (which entirely precludes their being employed in respiration) is made up for by the

great difference in the capacity of the thoracic and abdominal cavities which results from differences in the degree of retraction of the limbs. And I also inferred that the activity of the respiratory movements—as in the Lobster, which has some of its larger gills connected with the bases of the ambulacral legs—must depend, in great measure, on the amount of the mechanical force employed in locomotion, in the same way that in the locomotive steam-engine the draught through the boiler-tubes of the furnace depends upon the rapidity of the movement of the engine, because the waste-steam pipe is made to open at the bottom of the funnel.

A specimen of *Trionyx perocellatus* (three and a half inches in length of carapace), which had died a day or two previously, lying on my dissecting-room table with its neck and limbs fully extended, I happened to take it up by the lateral margins of its shell, when, upon grasping it between my fingers and thumb, I noticed, to my surprise, that its head and limbs immediately retracted to their full extent. At first I was inclined to attribute the movement to the persistence of muscular irritability in the recently dead individual, but, on making a cut into one of the limbs, found that this was not the case.

As frequently as I chose to extend the head and limbs to their full extent they so remained until the body was laterally compressed, whether it happened to be lying on its abdomen or on its back, or in any other position. Immediately it was pinched the limbs were completely withdrawn from view and the head fully retracted—the cervical region of the spine, from being straight, assuming the curve essential to the cephalic retraction.

To determine the mechanism of this unexpected movement was my next proceeding; and I made a small hole in the centre of the plastron which opened into the body-cavity. I then again, with the limbs and head extended, repeated the lateral compression, and found that they were no longer retracted as they had been previously, air rushing in at the newly-formed opening. Upon extending the head and limbs and closing the orifice, full retraction followed lateral compression, as at first. This experiment was repeated several times with the same result.

It then became evident that in laterally compressing the plastron (which in the extended conditian projects beyond the margins of the carapace) its slight convexity is increased, and that this is associated with an augmentation of the capacity of the body-cavity, which, to fill the deficiency thus produced, causes an insucking of the head and limbs upon simple pneumatic principles. The retraction of the head and limbs is therefore nothing more than a movement of suction, and does not depend upon any important direct osteological or myological peculiarities of the animal.

Whether the creature is in the habit during life of employing this suction method of withdrawing itself within its shell is a question that I am not able to determine just now, as the number of Soft Tortoises living at the present time in the Society's Gardens is reduced to a single large Egyptian *Trionyx*, which is unmanageable and of a more rigid build than the one above described.